

Role Of Third Party Agency In FPSO/FSO EPCIC Project

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Abstract: FSO/FPSO's engineering, procurement construction and installation (EPCIC) project usually involve a number of different Sub-Contractors and Third Party Agencies (TPA) for supply of major component and services to the main Contractor. Classification, Certification and Verification are critical services for successful completion of FSO EPCIC Project in offshore oil and gas industry. Due to complex nature of project and lack of defined roles and responsibility of Third Party Agencies, a large numbers of change orders requests occur among Owner, Contractor and Sub-Contractor. Each offshore project is unique in its type and may require different combination of rules & regulations, codes & standards applicable for FSO/FPSO EPCIC Project. Ambiguous and unclear roles of Third Party Agencies in the Project further create serious dispute among various parties and adversely affect the project quality, schedule and budget. It is therefore essential that a minimum standard roles and responsibility of Third Party Agencies in the EPCIC project is properly defined with identification of applicable rules & regulations, or codes & standards.

Index Terms: FSO,FPSO,EPC,EPCIC,CA,VA, Offshore ,Oils and Gas, Class, Classification, Verification, Engineering, Procurement, Construction, Installation, Third Party Agencies, TPA, Roles & Responsibility, Rules & Regulations, Codes& Standard, Project Quality, Schedule, Budget, Planning ,Approval .

1 INTRODUCTION

FSO is the abbreviation to floating, storage and offloading installation or mobile unit, which is a unique and highly effective means of developing oils and gas field that are either located in very deep waters or small and uneconomical or isolated from an established pipeline structure. Floating Storage Offloading provide a number of practical advantages but also posses lot of challenges and problems related to quality, schedule and budget of the project. Based on conventional shipbuilding technology and combined with current drilling and production technological advances, the FSO new building project present significant complex facilities at offshore site. FSO AND FPSO have ability to handle heavy payloads and to add equipment incrementally to fit production, storage, offloading and reservoir changes as well as offering liquefaction, gasification and degasification and Turret mooring facilities. They are easier to uninstal, decommission and can be used again in other field. It is also the current technical developments favor the use of FPSOs for larger fields and in deep water operations. With oil price likely to remain high and depleting oils and gas reserves, much field development will go ahead with high capital expenditures in deeper water. With consortium and alliances Contract structure is getting popular and meeting the need of bigger engineering, procurement, construction, installation and commissioning (EPCIC) projects, the construction of FSO/FPSO components at various geographical location present unprecedented challenges for EPCIC Contractor to meet planned schedule and budget.

2 EPCIC PROJECT AND TPA

EPCIC project requires the Contractor to perform design, engineering, procurement, construction installation and commissioning work at various onshore and offshore sites. With different location of construction and installation site make quite difficult for the EPCIC Contractor to maintain best quality with minimizing the project cost and schedule. Under these circumstances the role of Third Parties Agency (TPA) becomes very critical and difficult along with different nationality of Owner, Contractor and Sub Contractor companies. Also the complex nature of offshore facility make harder for Owner, Contractor and Sub Contractor to clearly identify the roles and responsibility of TPA. The changing nature of today global oil and gas industries is clearly reflected by the increasing number of FSO, FPSO, FLNG, and FSRU system worldwide and operation in offshore deep waters. The role of and responsibility of TPA like Classification Society, Certification Agency ,Verification Agency, Marine Warranty Surveyor etc becomes more challenging and demanding. EPCIC Contractor challenges have been increase exponentially due to high volatility in current globalized oil and gas industry which is influenced by many factors with continuously rising demand of strict rules and regulation by international statutory body and organization. In theses challenging situations, Contractor must have a clearly defined set of roles and responsibility matrix of third party agencies in new building FSO/FPSO Project.

3 THIRD PARTY AGENCY

Third Party Agency provides Classification, Inspection, Survey, Verification and Certification services in accordance with internationally recognised rules, regulation, codes, standards, design specifications and specific technical requirements applicable to the project. TPA verify whether ordered product, equipment, materials or goods have been manufactured in accordance with a client's specifications and other applicable quality system requirements. TPA deliverables reflect unbiased statement of fact reporting ,confirmation, certification, verification and inspection services as per internationally recognized rule, regulation codes, standards etc. Depending on the EPCIC project requirement and Owner's specification, a single TPA can act as Inspection Agency, Classification Agency, Verification Agency, Surveyor and Certification Agency. EPCIC Contractor can assign separate agency for these work and services as it is suitable to the Contractor as per project

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execution plan and successful completion of the project. Deployment of Classification society, Certification agency and Verification agency on a particular project shall depend upon the Owner's specification and flag administration requirements. Classification Society shall act as independent third party for Classification, Verification and Certification services.

3 TPA IN FSO AND FPSO PROJECT

3.1 Classification Agency

Classification Agency provides the services to verify that materials, components and systems used in societies classed vessels comply with the class rule requirements. These services are the integral part of the classification services. The scope of Classification includes and requires that specified materials, components and systems intended for the vessel are certified in accordance with the class rules. Materials, Components and Systems which cannot be covered by class rules, shall be certified and/or verified through Certification agency and/or Verification agency. On the basis of a review and a decision, a classification agency issues a written statement confirming that fulfillment of specified requirements has been demonstrated as per classification society rules and regulation. For the classification, it is mandatory for the agency to follow the published rules and regulations of class.

3.2 Certification Agency

For certification, the agency shall follow various international standards and code as applicable and required by owners and flag administration. Generally Certification service are avail by owners or EPCIC Contractor for those item which cannot be classified or cover under published class rules and regulations. Certification Agency focus shall be on the structural, mechanical and functional integrity of the offshore installation or mobile unit. Many of the classification society have their subsidiary or affiliates who can perform the work of Certification and Verification agency.

3.3 Verification Agency

Verification Agency shall ensure that the installation possess such integrity as is reasonably practical. Integrity means structural soundness and strength, stability on case of floating installation, buoyancy in so far as they are relevant to health and safety of the person. Verification agency can be deployed by Owner or EPCIC Contractor on the specific project and the main focus of the Verification agency shall be safety integrity of the offshore oils and gas installation or mobile unit. Verification is based on a formalized approach to risk assessment and management such as a Safety Case regime. The objective of the Verification Agency is to put in place independent and competent scrutiny of the parts of an installation that are critical to the safety. The verification scheme should be written and provided independent check to confirm the continuity stability of the safety critical equipments through the life cycle of the offshore installation and unit. Generally, Verification Agency for Offshore project applies following rules and regulations at minimum:

- Health and safety at work at etc act 1974(HSWA Act)
- Safety Case regulation (SCR)-SI 1992/2885
- Prevention of Fire and Explosion, and emergency response regulation (PFEER) SI-1995/743
- Design and Construction regulation (DCR) SI-1996/913
- Management and administration Regulation (MAR)-SI 1995/738
- Provision and Use of the Work equipment Regulation (PUWER)-SI 1992/2932
- Pipeline safety regulation (PSR) SI-1996/825
- Civil Aviation Authority (CAA) Publication CAP 437
- Offshore helicopter landing Area

3.4 Marine Warranty Surveyor

The Marine Warranty Surveyor's role is to facilitate, by technical examination, the continuation of insurance cover during those periods of a marine related activity when Class is not involved or Class is suspended. This allows for seamless insurance cover throughout the construction phase covering operations which may result in claims that exceed the deductible, either individually or cumulatively. MWS provide independent technical assurance of marine operations as an independent third-party review and approval of marine construction, installation and transportation works in EPCIC Projects. Also, a marine warranty survey is the supervision of marine operations on behalf of a client and according to the insurer's interests. Even if an MWS is not required by the insurer, most Owners and Operators request a marine warranty surveyor to ensure safety, reliability, and compliance of their installations with applicable standards. MWS can be engage on the EPCIC project through Owner or Contractor or Sub-Contractor depending on the project terms and conditions.

4 FSO PROJECT

Generally, Owner or Company develop plan to replace the existing Floating Storage Offloading (FSO) with a new built FSO vessel at its offshore oil and gas field or install new FSO to new discovered field. The fields are usually located at a distance of several hundred kilometer far from coastal line and land facilities. Since FSO do not have production facility onboard, so installed FSO are connected to production platform or central processing complex through the subsea pipeline. As per normal standard practice, Contractor get contract awarded to provide Engineering, Procurement, Construction, Installation and Commissioning (EPCIC) of the new offshore FSO facilities which consist of the following :-

- A Single Point Mooring (SPM) system;
- A Floating Storage and Offloading Vessel;
- A Subsea System

The three major system of FSO project has been shown in the in Table 1. Also the components and the critical items of each system have been identified. Also refer to Figure 3 for a general offshore oil and gas field of EPCIC FSO new building Project.

| Item No. | Project System | Description |
|----------|----------------|--|
| 0. | FSO Vessel | New Built FSO |
| 1. | Subsea System | New J-Tube from Dp4 Platform |
| 2. | | Power Cable |
| 3. | | Tie in details Existing Pipeline form DP-4 Platform to SPM |
| 4. | | 16" flexible flow line |
| 5. | | Pipeline End Manifold |
| 6. | | 16" Riser |
| 7. | | 16" Riser |
| 8. | | 10" Riser |
| 9. | | Mid Water Arch |
| 10. | SPM System | External Column Turret |
| 11. | | Mooring Chain |
| 12. | | Anchor Piles |
| 13. | | Existing Pipeline |
| 14. | | Exiting Tower Mooring System |

Table 1 : FSO Project Systems

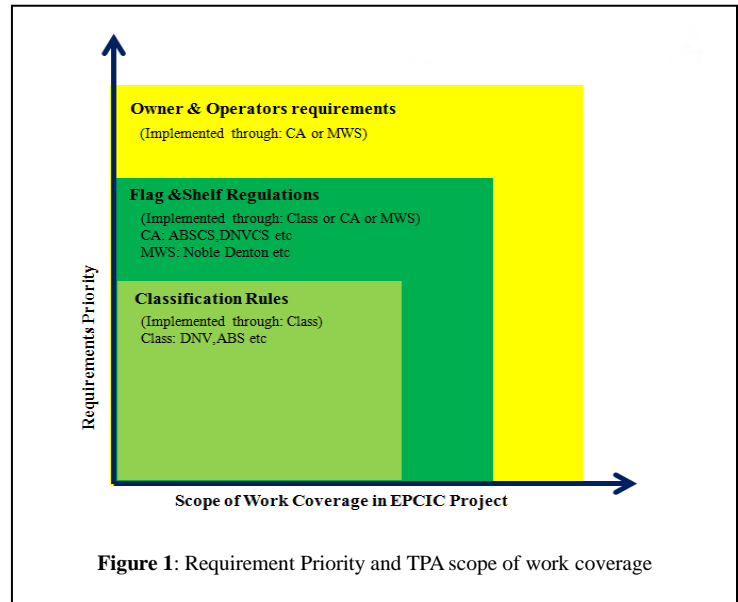
5 OFFSHORE INSTALLATION OR MOBILE UNIT

FSO and FPSO can be a offshore installation or mobile unit depending on the configuration of the vessel system. FSO can be regarded as Mobile offshore Units if it is equipped with self powered propulsion system. Generally, this type of vessel is classed as offshore Installations according to 1A1 MOU main class. If FSO and FPSO do not have self power propulsion system then they can be regarded as Offshore Installation to be moored permanently at site. Offshore facility which are permanently placed and non self-propelled vessel are recognized as floating offshore installations .These type of vessel are classed as offshore Installations according to OI main class. Offshore Installation and Mobile Unit will be certified or classified based on the following activities which include Design approval, Certification of materials and components, survey during construction & installation and survey during commissioning & start-up .Any deviations, exemptions and modifications to the design codes and standards given as reference documents shall be documented and approved by Class. Where referred codes and standards call for the extent of inspections and tests to be agreed between EPCIC Contractor, manufacturer and Owner, the resulting extent is to be agreed with Class.

6 PROJECT SCOPE COVERAGE BY TPA

Project scope covered by TPA should be clearly defined and identified at very beginning of the FSO project. An illustration between requirement priority and TPA scope of work coverage of FSO project has been shown in figure-1. It is EPCIC Contractor prime responsibility to identify role & responsibility of each party and assign TPA for the corresponding items and area of FSO project. Classification Rules shall be covered by Classification Society (Class) as required for the project. Generally, Flag and Shelf regulation certification can be provided by Classification Society. If Owner and Operator impose requirements of special standards additional to other rules and regulations for system safety and integrity then

EPCIC contractor shall comply with same .Generally it is implemented through Certifying Agency (CA) and another Third Party Agency (TPA) as suitable for the project. TPA can be nominated by Owner or Operators, If not than EPCIC Contractor shall nominate the same for the Project. Marine Warranty Surveyor shall refer to standards and practice applicable to project based of conditions specified by Insurance Agency in Construction All Risk Insurance policy (CAR) for the Project. Main role of Marine Warranty Surveyor (MWS) is to witness, Inspect and certify all the marine operation works (including onshore and offshore) of EPCIC project

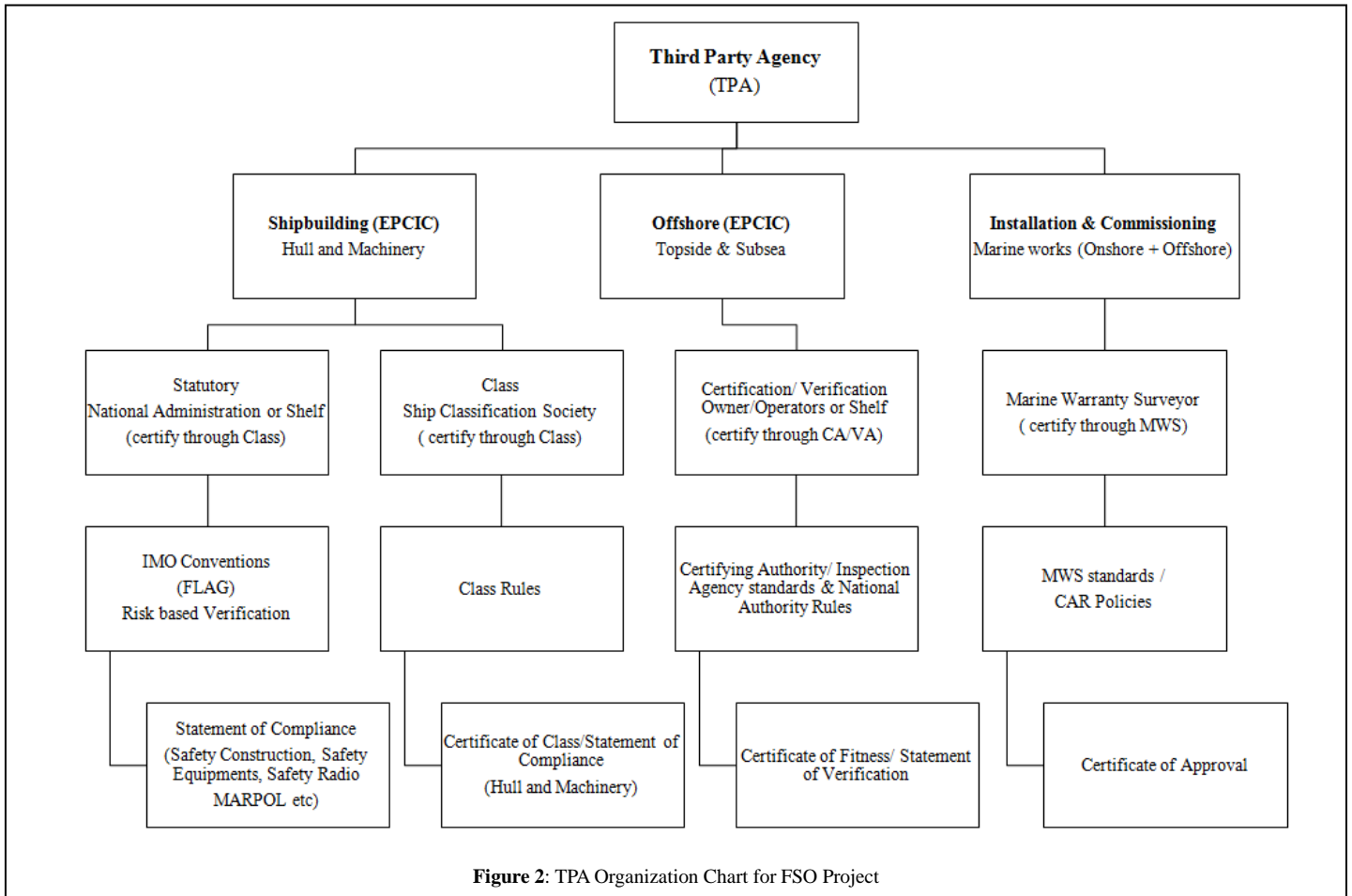


7 PROJECT ORGANIZATION CHART FOR TPA

An FSO hull is usually consider a separate body to the topside oil and gas processing systems and classed by classification society. The topside oil and gas system need to be certified or verified. Topside verification and certification may be carried out by the same classification society which is classing the hull. EPCIC Contractor is required to organise all the TPAs required for the EPCIC project. Contractor shall engage the respective TPA for the corresponding identified area and work. A TPA organization Chart for FSO project has been illustrated in Figure 2.

8 TPA ROLE AND RESPONSIBILITY MATRIX –FSO VESSEL, SPM AND SUBSEA SYSTEM

A standard role and responsibility matrix of TPA has been identified and drafted for new building FSO Project in Table 2. The illustrated matrix can be utilizes for the identification of TPA role and responsibility in any new building FSO vessel. Following matrix in Table 2, 3 & 4 illustrate the minimum responsibilities of TPA at various phase of the FSO project. It can be further customize for the each new building project as per the requirement of the Contractor.



9 CLASS CERTIFICATION VERSUS NON- CLASS CERTIFICATION

Accumulated class certification of design, material component, systems, manufacturer and production of vessel according to published rules and regulation of society leads to classification of vessel. Class is also doing independent third party certification (non-class certification) to other standards than the Class rules. In this case, Class is acting as an independent certification body authorized by the owner, EPCIC contractor, subcontractor or flag administration. Basis for the certification is national and international standards and ordered specifications. After finishing the work and when compliance with the specification and standard has been confirmed, an inspection certificate shall be issued by the manufacturer and validated by independent third party agency.

10 STATUTORY CERTIFICATION

The Society undertakes statutory certification on behalf of flag administrations when and to the extent the Society has been authorised to do so by the individual flag administration. Statutory certification includes inter alia approval, survey and the issuance of statutory certificates. When the Society acts on behalf of a flag administration, the Society follows international statutory instruments, IACS Unified Interpretations and Class Statutory Interpretations, and generally follows guidance issued by IMO in Circulars etc. unless the flag administration has instructed the

Society otherwise. It is assumed by the Society that required statutory surveys for vessels classed by the Society will be carried out by the Society or by officers of the flag administration itself and that statutory certificates will be issued by the Society or by the flag administration with the exceptions if any applicable. When statutory certification is undertaken, the document requirements for approval and the survey requirements are based on IMO resolution, Survey Guidelines under the Harmonized System of Survey and Certification, unless otherwise specified exclusively. The IMO guidelines also applied as applicable for the HSC Code and the MODU Code.

11 SHELF STATE & FLAG STATE COMPLIANCE

Offshore oil and gas project throughout the world are subject to a variety of International, National (coastal state), Flag and Classification Society Rules and Regulations. The requirements are usually governed by the laws of the local coastal or territorial waters' National Authorities, but particularly where no relevant legislation exists, they may also be influenced by the requirements of the Insurance Underwriters or Operator's company policy. Shelf State Compliance is related to national area of operation. Shelf State can specify requirements to such offshore oil and gas project on matters which may range from taxation, working environment, management systems to environmental and technical safety. Flag State Compliance is related to International area of operation for voyage. Normally flag

state requirements are synonymous with the IMO Conventions.

project. The process may be customize by EPCIC Contractor to meet it project execution plan and methodology.

12 TPA ROLE AND RESPONSIBILITY MATRIX –FSO VESSEL, SPM & SUBSEA SYTEM

A standard role and responsibility matrix of TPA has been indentified and drafted for new building FSO Project in Table 2, 3 & 4. The illustrated matrix can be utilizes for the identification of TPA role and responsibility in any new building FSO vessel. Following matrix illustrate the minimum responsibilities of TPA at various phase of the project. It can be further customize for the each new building project as per the requirement of the Contractor.

12 CERTIFICATION OF MATERIALS AND COMPONENTS

12.1 Material Certification

Material certification based on the class rules, will in most cases include the following two main elements, the approval of the Manufacturer and testing & inspection of the individual materials. The objective of the testing and inspection is to verify and document that the materials are in compliance with the purchase order, the specified rule requirements and the material standard accepted as part of a design approval. Accordingly, it is important that prior to the testing and inspection, the manufacturer provides the Class surveyor with the technical specifications of the ordered items. Certification normally includes both plan approval and survey during production and/or of the final product. The plan approval of materials, components and systems shall either be on a case by case basis or follow the procedure for approval.

12.2 Certification at a Manufacturer

In general, certification of materials, products and systems will be carried out at the manufacturer facilities i. e. where materials, products and systems are being manufactured. Generally, new and unused materials, products and systems can be certified. Accordingly, 2nd hand (i.e. used) equipment will not be certified. Third party involvement in 2nd hand -equipment will be documented by survey reports subject to applicable rules, regulations and standards.

12.3 Certification at an Intermediary

Occasional certification at an Intermediary may be performed when all possibilities for a normal certification procedure at the manufacturer are excluded due to short delivery times, e.g. delivery to repair of ships in operation and intended use or installation is not known at time of production.

12.4 Product Certification

The applicable chapters of the Class rules define the extent of the certification that is required. Product certification includes normally both approval of the product design, and survey during the production and / or of the final product on case by case basis.

13 CLASSIFICATION, CERTIFICATION AND APPROVAL PROCESS OF EPCIC PROJECT

A standard classification certification and approval process has been illustrated in Figure 4 for FPSO/FSO EPCIC

| Facility | Phase | Activity | CLASS | CA | MWS | Remarks | |
|---|--|--|-------|----|-----|---------|--|
| FSO VESSEL | Design and Engineering | Review/Approval Design Basis and Engineering Specification, P&IDs | Y | | | | |
| | | Review/Approval Engineering Reports (as required) | Y | | | | |
| | | Review/Approval Material Specification | Y | | | | |
| | | Review/Approval Other Drawings | Y | | | | |
| | Procurement Tandem Offloading & Mooring system Fiscal Metering Package System Diesel Driven Emergency Fire Pump HVAC System Galley hood with Fire Fighting System & Galley Duct Co2 System Deluge System Sprinkler System Co2 Firefighting System | Material & Equipment Inspection | | | Y | | |
| | | Witness FAT etc | | | Y | | |
| | Fabrication | Welder & Welding Procedure Qualification | Y | | | | |
| | | NDT Operator Qualifications | Y | | | | |
| | | Quality Plan Review | Y | | | | |
| | | Construction & Outfitting Procedure (if applicable) | Y | | | | |
| | | Inspection and Survey during fabrication (as required) | Y | | | | |
| | | Weight Control, Monitoring and Weighing | Y | | | | |
| | | Class, Flag and Statutory Certification | Y | | | | |
| | Mech. Comp. & Pre-Commissioning | Testing Plan & preparation for commissioning (as required) | Y | | | | |
| | Launching & Trial Towing | Launching & Trial Towing of FSO Hull | | | Y | | |
| | Transportation to Libya | Towing Plan/Manual | | | Y | | |
| | Offshore Installation at site | Unfastening (if applicable) | | | Y | | |
| | Commissioning at site | Commissioning procedure and Plan | Y | | | | |
| | CLASS : | All concerned works shall be carried out according to the normal shipbuilding practices. | | | | | |
| CA : | All concerned works shall be carried out according to the normal offshore-work practices. | | | | | | |
| MWS : | Marine warranty survey works shall be carried out according to the normal offshore-work practices. | | | | | | |
| Y | Y means Applicable Rule & Regulation or Code & standards | | | | | | |
| CLASS means Classification Society, CA means Certification Agency, MWS means marine warranty Surveyor | | | | | | | |

Table 2: TPA Role and Responsibility Matrix for FSO Vessel

| Facility | Phase | Activity | CLASS | CA | MWS | Remarks | |
|---------------|---|---|-------|----|-----|---------|--|
| SUBSEA SYSTEM | Design and Engineering | Review/Approval Design Basis and Engineering Specification, P&IDs | | Y | | | |
| | | Review/Approval Engineering Reports (as required) | | Y | | | |
| | | Review/Approval Material Specification | | Y | | | |
| | | Review/Approval Other Drawings | | Y | | | |
| | Procurement Mid water Arch Flexible riser/Flow line Subsea Power Umbilical /cable PLEM I-Tube/J-Tube | Material & Equipment Inspection | | | Y | | |
| | | Witness FAT etc | | | Y | | |
| | Fabrication (at fabrication yard) | Welder & Welding Procedure Qualification | | | Y | | |
| | | NDT Operator Qualifications | | | Y | | |
| | | Quality Plan Review | | | Y | | |
| | | Construction & Outfitting Procedure (if applicable) | | | Y | | |
| | | Inspection and Survey during fabrication (as required) | | | Y | | |
| | | Weight Control, Monitoring and Weighing | | | Y | | |
| | Mech. Comp. & Pre-Commissioning (at fabrication yard) | CA Certification | | | Y | | |
| | Load out & Tie-Down (at fabrication yard) | Testing Plan & preparation for commissioning (as required) | | | Y | | |
| | Transportation (to Libya offshore site) | Lifting, Load out & Sea Fastening | | | Y | | |
| | Geophysical and Geotechnical Survey | Transportation Plan & Storage Plan | | | Y | | |
| | Offshore Installation | Survey for Installation Work | | | Y | | |
| | Commissioning at site | Unfastening, Lifting and Lowering, tie-ins | | | Y | | |
| | | Commissioning procedure and Plan | | | Y | | |

Table 4: TPA Role and Responsibility Matrix for SUBSEA System

| Facility | Phase | Activity | CLASS | CA | MWS | Remarks | |
|---|--|---|--|----|-----|--------------------------|--|
| SPM SYSTEM | Design and Engineering | Review/Approval Design Basis and Engineering Specification, P&IDs | Y | | | | |
| | | Review/Approval Engineering Reports (as required) | Y | | | | |
| | | Review/Approval Material Specification | Y | | | | |
| | | Review/Approval Other Drawings | Y | | | | |
| | Procurement Swivel stack Riser winch Mooring Winch HPU Mooring line& Connector Pile system | Material & Equipment Inspection | | | Y | | |
| | | | Witness FAT etc | | Y | | |
| | Fabrication | | Welder & Welding Procedure Qualification | Y | | | |
| | | | NDT Operator Qualifications | Y | | | |
| | | | Quality Plan Review | Y | | | |
| | | | Construction & Outfitting Procedure (if applicable) | Y | | | |
| | | | Inspection and Survey during fabrication (as required) | Y | | | |
| | | | Weight Control, Monitoring and Weighing | Y | | | |
| | | Class or CA Certification | Y | Y | | For each concerned works | |
| | For ETMS | Mech. Comp. & Pre-Commissioning (at Keppel yard) | Testing Plan & preparation for commissioning (as required) | Y | | | |
| | | Load out & Tie-Down (at Keppel yard) | Lifting , Load out & Sea Fastening | | | Y | |
| | | Transportation | ETMS transportation to yard | | | Y | |
| | | Installation | Installation with FSO hull | | | Y | |
| | | Integration | Integration with FSO hull | Y | | | |
| | For Pile System, Mooring line & Connector | Load out & Tie-Down (at fabrication yard) | Lifting , Load out & Sea Fastening | | | Y | |
| | | Transportation (to Libya offshore site) | Transportation Plan & Storage Plan | | | Y | |
| Offshore Installation | | Unfastening , Lifting and Lowering, tie-ins | | | Y | | |
| ETMS, Pile System, Mooring line & Connector | Commissioning at site | Commissioning procedure and Plan | Y | Y | | For each concerned works | |

Table 3: TPA Role and Responsibility Matrix for SPM System

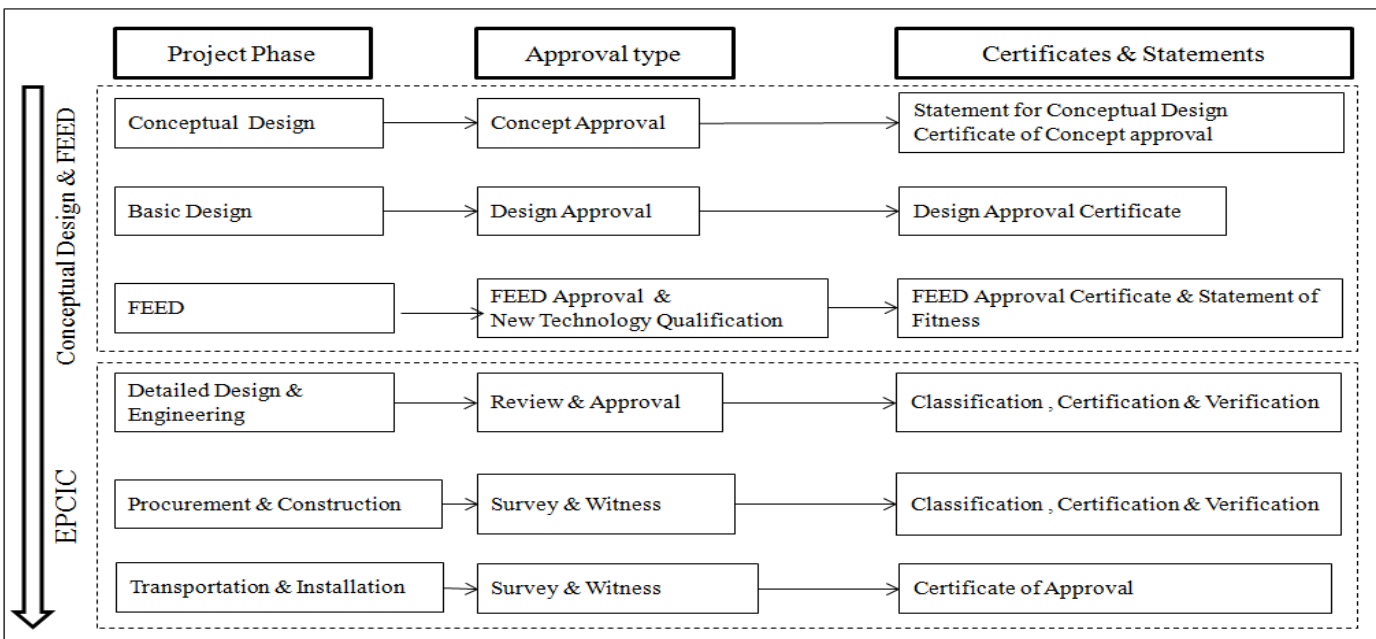


Figure 4: TPA Classification, Certification and Approval Process of EPCIC project

14 DESIGN AND CONSTRUCTION REQUIREMENT FOR FSO/FPSO BY TPA

A minimum Design and Construction requirement for FSO/FPSO by TPA has been identified in Table 5 & Table 4. EPCIC Contractor can use the following information to clearly define and indentify the area and system of FSO project for TPA responsibility.

15 RESULTS

A large number of change order requests with cost running up to several million dollars have been prevented on FSO EPCIC Contract. Also knowing a clear role and responsibility of TPA reduce unnecessary project delay and leads to timely completion of all TPA related work with meeting all quality standards sets in the Contract specification. Most EPCIC projects have a high technical standards and high-quality management. In author's experience, potential problem occurs because of misunderstandings and unclear demarcations at interfaces with Contractor and TPA role and responsibility. Author also indentified in appendices a standard set of rules, regulation codes and standard applicable for an FSO EPCIC project

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DESIGN AND CONSTRUCTION REQUIREMENT FOR FSO /FPSO BY TPA

| Item No | Discipline Area | FSO/FPSO |
|---------|--|---|
| 1 | Safety Principles and Arrangement | Design principles, including generic accidental loads Arrangement; including segregation of areas and location of plants and equipment Escape and evacuation. |
| 2 | Materials | Rolled steel for structural applications, boilers and pressure vessels Steel tubes, pipes and fittings Steel forgings Steel castings Aluminum alloys. |
| 3 | Structural Design | Structural design shall comply with the following design codes depending on hull shape and applied design methodology. Transit conditions are included in the structural design scope of work |
| 4 | Fabrication and Testing of Offshore Structures | Welding procedures and qualification of welders Fabrication and tolerances Testing Corrosion protection systems |
| 5 | Stability and Watertight Integrity | Intact and damaged stability Watertight integrity Freeboard Watertight closing appliances |
| 6 | Position Keeping and Towing | Depending on type of unit, main class stipulates requirements for: Position keeping Temporary mooring Towing. Ship-shaped units shall have an arrangement for temporary mooring complying with Rules for Classification of Ships, for floating offshore installations of the ship-shaped, the additional class compliance with position mooring is mandatory. The design of the mooring system shall be in accordance with Class rule or alternatively the design may be based on compliance with API RP 2SK. |
| 7 | Marine and Machinery Systems and Equipment (for Mobile Offshore Unit only) | Requirements for marine and machinery systems and equipment include: General piping design, fabrication and testing Pumps, valves and pipe connections Ballast, bilge and drainage systems Air, overflow and sounding pipes Cooling, feed water and condensation systems Lubricating oil, fuel oil and thermal oil systems Hydraulic, steam and pneumatic systems Heating, ventilation and air conditioning systems Propulsion and auxiliary machinery including thrusters Boilers, pressure vessels and incinerators Anchoring and mooring equipment Steering, jacking gear and turret machinery |
| 8 | Utility Systems and Equipment (for Offshore Installation only) | Requirements for utility systems and equipment include: General piping design, fabrication and testing Pumps, valves and pipe connections Ballast, bilge and drainage systems Air, overflow and sounding pipes Hydraulic, steam and pneumatic systems Heating, ventilation and air conditioning systems Pressure vessels and incinerators Turret machinery, as applicable |
| 9 | Electrical Systems and Equipment | Electrical systems and equipment include: System design Switchgear and control gear assemblies Rotating machinery Static converters Cables Miscellaneous equipment Installation and testing |

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| | | A.C. supply systems. As far as relevant for supplying marine (e.g. ballasting, bilge, mooring), fire fighting and emergency services. |
| 10 | Instrumentation and Telecommunication Systems | Instrumentation and telecommunication systems and equipment include: design principles and system design Computer based systems Component design and installation Environmental conditions User interface |
| 11 | Fire Protection | Fire protection includes: Passive fire protection Active fire protection Fire fighting systems Fire and gas detection system |
| 12 | Preparation for Surveys and Inspections on Location (for MOU only) | The operational survey and inspection aspects are taken into consideration at the design and construction stages. The following matters will be taken into consideration for acceptance of surveys to be carried out on location: Arrangement for underwater inspection of hull, propellers, thrusters, rudders and openings affecting seaworthiness marking of the hull means for blanking off all openings including side thrusters use of corrosion resistant materials for shafts use of glands for propeller and rudder Accessibility of all tanks and spaces for inspection corrosion protection of hull or structure maintenance and inspection of thrusters measurement of wear in the propulsion shaft and rudder bearings Testing facilities of all important machinery. |

Table 4: Design and Construction Requirement for FSO /FPSO by TPA

ADDITIONAL DESIGN AND CONSTRUCTION REQUIREMENT FOR FSO /FPSO BY TPA

| Item No. | Additional Area Requirements | FPSO | FSO |
|----------|--|---|---|
| 1 | Safety Principles and Arrangement | Arrangement Area classification Shutdown Escape evacuation and communication. | Arrangement Area classification Shutdown Escape evacuation and communication. |
| 2 | Structural Design | Process area foundations Turret or submerged turret structures. The structural strength shall be as required for the main class taking into account necessary strengthening of supporting structures for equipment applied in and forces introduced by the production facilities and operation. | Turret or submerged turret structures, as applicable. |
| 3 | Marine and Machinery and Utility Systems | Piping arrangements Ventilation in hazardous areas Turret machinery Use of gas and crude oil for auxiliary boilers and turbines. | Liquid cargo transfer and stripping Liquid cargo storing, segregation and treatment venting, inerting, gas freeing and vapour emission control oil discharge control crude oil washing system ventilation in hazardous areas Turret machinery |

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| 4 | Fire Protection | Passive fire protection Fire water systems Active fire protection of specific areas Fire detection and alarm systems Gas detection | Passive fire protection Fire water systems Active fire protection of specific areas Fire detection and alarm systems Gas detection |
| 5 | Industrial Equipment | Production related systems and equipment which are installed in enclosed hull compartments below the damage water line shall be included in the scope of classification | |
| 6 | Preparation for Surveys and Inspections on Location | | The operational survey and inspection aspects are taken into consideration at the design and construction stages. |

Table 5: Additional Design and Construction Requirement for FSO /FPSO by TPA**APPENDICES****APPENDIX-A: RULES, REGULATIONS, CODE AND STANDARDS FOR FSO VESSEL**

| FSO Systems/Areas | Rules & Regulation / Codes & Standards | TPA |
|-------------------------|--|-------|
| General | Classification Society rules for designing and Construction of offshore facilities | Class |
| | Classification Society Guidelines for Floating Offshore Installations | |
| | MODU Code as Applicable | |
| | Codes for the Construction and Equipment of Mobile Offshore Unit(MODU),1989 | |
| | API RP 2L, Recommended Practice for Planning, Designing and Constructing Heliports for Fixed Offshore Platforms | |
| | Oil Companies International Marine Forum (OCIMF) | |
| | Classification Society Guidance notes for FSO | |
| | IEC 60092: Electrical Installation in ships | |
| Statutory | International Load line Conference 1966 | Class |
| | International Convention on Telecommunications 1973 and Radio Regulations 1982 | |
| | International Labor Organization (ILO) | |
| | International Convention for Safety of Life at Sea(SOLAS),1960 and 1074 | |
| | International Regulation of preventing Collisions at Sea(COLREG),1972 | |
| | International Convention on standard of training, certification and watch keeping for Seafarers (STCW), 1978 and 1995 amendments | |
| | International Convention for the prevention of pollution from ships as modified by protocol of 1978(MARPOL 73/78) plus amendment | |
| | MARPOL Annex IV, Prevention of Pollution by sewage | |
| | MARPOL Annex V, Prevention of Pollution by Garbage | |
| | MARPOL Annex VI,OX Technical Code | |
| | International Convention for Tonnage Measurement of Ships(Tonnage), 1969 | |
| | International Convention on Oil Pollution Preparedness, Response and Cooperation,1990 | |
| Cargo System | MARPOL protocol of 1978(MARPOL 73/78) , 13G, Annex I,II,III,IV | Class |
| Cargo Offloading System | Guide to purchasing, manufacturing and testing of Loading and Discharge Hoses for Offshore Moorings, OCIMF 1991 | Class |
| | SPM Hose Ancillary Equipment Guide ,3rd Edition ,OCIMF 1987 | |
| | SPM Hose System Design Commentary ,3rd Edition ,OCIMF 1993 | |
| | Classification Society Certified Hoses | |
| Tandem Mooring System | Recommendations for Equipment Employed in the Mooring of Ships at Single Points Moorings, OCIMF | Class |
| | Mooring Equipment Guidelines 2nd Edition, OCIMF 1997; | |
| | Guide to Purchasing Hawsers, OCIMF 1987 (Vol. 1 of Hawsers Guidelines); | |

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| | Procedures for Quality Control and Inspection During Production of Hawsers, OCIMF 1987 (Vol. 2 of Hawsers Guidelines); | |
| | Prototype Rope Testing, OCIMF 1987 (Vol. 3 of Hawsers Guidelines). | |
| Electrical System | IEC 600092 Electrical Installations in Ships | Class |
| | IEC60079 Electrical Apparatus for explosive Gas Atmosphere | |
| | IEC 60529 Degree of Protection Provided by Enclosures (IP Code) | |
| | Classification Society rules and Regulations for Construction and Classification of see going steel ships | |
| | Classification Society rules and Regulations for Oil production and storage vessels | |
| Vessel Metering Package | Libyan National Regulatory Requirements | Class |
| | ISO 3171 Flow Proportional Sampling | |
| | ISO 5168 Measurement of Fluid Flow-Estimation of uncertainty of a flow rate measurement | |
| | API 11N Specification for Lease Automatic Custody Transfer (LACT) Equipment | |
| | API Manual of Petroleum Measurement Tables | |
| | API 2540 Petroleum Measurement Tables | |
| FSO Mooring | Classification Society rules for designing and Construction of offshore facilities | Class |
| | API RP-2A-WSD: Recommended Practice for Planning, Designing and Constructing Fixed offshore platform- Working Stress Design | |
| | API RP 2SK: Recommended Practice for Design and Analysis of station Keeping System for Floating Structures | |
| | API 2F: Specification for Moring Chain | |
| | API RP 2M: Rccomomeded Practice for Qualification Tests of Designs Steel Anchors for Floating Structure | |
| | API RP 17B: Recommended Practice for Flexible Pipes | |
| | API RP 17J: Draft Specification for Unbounded Flexible Pipe | |
| | API RP 17 K: Draft Specification for Bonded Flexible Pipe | |
| FSO Vessel | Classification Society rules for designing and Construction of offshore facilities | Class |
| | Classification Society Guidelines for Floating Offshore Installations | |
| | International Load line Conference 1966 | |
| | International Convention on Telecommunications 1973 and Radio Regulations 1982 | |
| | MODU Code as Applicable | |
| | International Labor Organization (ILO) | |
| | Oil Companies International Marine Forum(OCIMF) | |
| | Classification Society Guidance notes for FSO | |
| | International Convention for Safety of Life at Sea(SOLAS),1960 and 1074 | |
| | International Regulation of preventing Collisions at Sea(COLREG),1972 | |
| | International Convention on standard of training, certification and watch Keeping for Seafarers(STCW),1978 and 1995 amendments | |
| | International Convention for the prevention of pollution from ships as modified by protocol of 1978(MARPOL 73/78) plus amendment | |
| | MARPOL Annex IV, Prevention of Pollution by sewage | |
| | MARPOL Annex V, Prevention of Pollution by Garbage | |
| | MARPOL Annex VI,OX Technical Code | |
| | International Convention for Tonnage Measurement of Ships(Tonnage), 1969 | |
| | International Convention on Oil Pollution Preparedness, Response and Cooperation,1990 | |
| | Codes for the Construction and Equipment of Mobile Offshore Unit (MODU),1989 | |
| | API RP 2L, Recommended Practice for Planning ,Designing and Constructing Heliports for Fixed Offshore Platforms | |
| IMO resolution A468 (XII):Code on Noise Levels on Board Ship | | |
| IEC 60092: Electrical Installation in ships | | |
| Metering Skid | API Manual of Petroleum Measurement Standards, Chapter 4.2, "Conventional Pipe Provers | CA |
| | API Manual of Petroleum Measurement Standards , Chapter 5.3 "Measurement Of Light Hydrocarbons by Turbine Meters" | |
| | API Manual of Petroleum Measurement Standards ,Chapter 8.2,"Automatic Sampling of | |

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| | petroleum and petroleum Product | |
| | ISO 3171-Flow Proportional Sampling | |
| | ISO 5168 –Measurement of Fluid Flow Estimation of Uncertainty of a flow rate Measurement | |
| | API 11N: Specification for Lease Automatic custody Transfer (LACT) Equipment | |
| Tandem Mooring Equipment and Offloading Hose | Recommendation for Equipments Employed in the Mooring of Ships at single Point Mooring, OCIMF | CA |
| | Mooring Equipment Guidelines, 2nd edition OCIMF 1997 | |
| | Guiding to Purchasing Hawsers, OCIMF, 1987 (Volume 3 of Hawser Guidelines) | |
| | Procedure for Quality Control and Inspection during Production of Hawsers, OCIMF 1987 | |
| | Prototype Rope Testing, OCIMF, 1987 (Volume 3 of Hawser Guidelines) | |
| | Guide to purchasing, manufacturing and testing of loading and discharge Hoses for offshore mooring, OCIMF 1991 | |
| | SPM Hose Ancillary Equipment Guide, 3rd Edition, OCIMF, 1987 | |
| | SPM Hose System Design Commentary, 3rd Edition, OCIMF, 1993 | |
| Corrosion Control | SSPC-SP-10/SA 2.5: Near-White Blast Cleaning | Class |
| | SIS 05 5900: Pictorial Surface Preparation for painting steel Surfaces | |
| | SSPC-PA2-73T: measurement of paint Thickness with magnetic Gages | |
| | DNV ZRP B401: Cathodic Protection Design | |
| | ASTM A123 Rev A: Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel products | |
| Non Destructive Examination | SNT-TC-1A: Recommended Practice for Personnel Qualification and Certification in Non Destructive Testing | Class |
| | API RP 2X: Recommended Practice for Ultrasonic and Magnetic Examination of offshore structural fabrication and guidelines for qualification of technicians | |
| | AWS D1.1: Structural Welding Code | |
| | ASME B31.3 Chemical Plant and Petroleum Refinery Piping | |
| Power Generation Module, Heat Medium Module and Inert Gas Module | ASME B31.8: Gas Transmission and Distribution Piping Systems; | Class |
| | ASME B31.3: Chemical Plant and Petroleum Refinery Piping Systems; | |
| | API Spec 5L: Specification for line Pipe; | |
| | API Spec 6D: Specification for Pipeline Valves (Steel Gate, Plug, and Check valves); | |
| | ASME B16.5: Pipe Flanges and Flanged Fittings; | |
| | ASME B16.9: Factory Made Wrought Steel Butt welded Fittings; | |
| | ASME B16.11: Forged Steel Fittings, Socket Welded and Threaded; | |
| | ASME B16.34: Valves – Flanged, Threaded and Welded End; | |
| | API 2000: Venting Atmospheric and Low Pressure Storage Tanks [For closed drain collection tanks]; | |
| | ASME Boiler and Pressure Vessel Code, Section VIII, Division I; | |
| | ASME Boiler and Pressure Vessel Code, Section IX: Welding and Brazing Qualifications; | |
| | American Welding Society, AWS D1.1: Structural Welding Code – Steel, 1998 [For WPS/PQR requirements]; | |
| | API RP 14A through 14J [As appropriate for safety systems]; | |
| | IEC 60079: Electrical Apparatus for Explosive Gas Atmospheres [All parts]; | |
| | IEC 60092: Electrical Installations in Ships [All parts]; | |
| | IEC 60529: Degree of Protection Provided by Enclosures (IP Code); | |
| | NEC 500 or 505: National Electric Code [See note below]; | |
| | EIA RS-485: Interface Between Data Terminal Equipment Employing Serial Binary data interchange; | |
| Nema ICS 30304: Programmable Controller Standard Recommendations | | |
| Note: IEC 60092 and NEC 500/API RP 14F are mutually inconsistent with respect to hazardous area definition. Contractor should standardize on one type of hazardous area definition (i.e. Zone vs. Class/Div) and specify procured equipment and installation standards accordingly. | | |
| Sloshing Analysis | Classification Society and IACS requirements | Class |
| Loading and Stability Analysis | MARPOL | Class |
| Fire and Foam System | SOLAS and Classification Society requirements | Class |
| Accommodation | IMO Resolution A468 (XII) – Code on Noise Levels on board Ships, modified as noted | Class |
| | IMO Resolution A486 (XII) Publication No. IMO-814E (Noise Levels on Board Ships) | |
| | ISO 6954 - Mechanical Vibration and Shock: Guidelines for the overall evaluation of vibration | |

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| | in merchant ships. | |
| | Applicable codes and good engineering practices as published by ARI, ASHRAE and SMACNA as well as relevant sections of the NFPA, NEMA and IEEE. | |
| | Applicable code of SOLAS, the Classification Society and the national authorities. | |
| Heli Deck | API RP 2L and the Libyan Civil | Class |
| Deck Cranes | API Spec 2C. | Class |
| Fixed Mooring Equipment | OCIMF | Class |
| Fuel System | Classification Society & API RP 14C. | Class |
| Pipes, Fitting, Valve & Miscellaneous | ISO/JIS/GB/CB/CBM standard. | Class |
| Emergency Generator | ISO-F-DMA, or ISO-F-DMX according to ISO 8217 | Class |
| Diesel Oil Bunkering System | OCIMF | Class |
| Sewage Treatment System | IMO | Class |
| Power Generation System | ASME B31.3. & ANSI ratings. With ASTM, DEMA and TEMA standards | Class |
| Diesel Driven Emergency Fire Pump | Design and Construction regulation (DCR) SI-1996/913 Management and administration Regulation (MAR)-SI 1995/738 Provision and Use of the Work equipment Regulation (PUWER)-SI 1992/2932 | CA |
| HVAC system | ARI, ASHRAE and SMACNA as well as relevant sections of the NFPA, NEMA and IEEE. Health and safety at work at etc act 1974(HSWA Act) | CA/VA |
| Galley Hood with FF&CO2 system | NFPA12 Health and safety at work at etc act 1974(HSWA Act) | VA |
| Deluge System | Safety Case regulation (SCR)-SI 1992/2885 Prevention of Fire and Explosion, and emergency response regulation (PFEER) SI-1995/743 | CA/VA |
| Sprinkler System | Safety Case regulation (SCR)-SI 1992/2885 Prevention of Fire and Explosion, and emergency response regulation (PFEER) SI-1995/743 | VA |
| CO2 Fire Fighting system | Safety Case regulation (SCR)-SI 1992/2885 Prevention of Fire and Explosion, and emergency response regulation (PFEER) SI-1995/743 | VA |

APPENDIX-B: RULES, REGULATIONS, CODE AND STANDARDS FOR SPM SYSTEM

| SPM Systems/ Areas | Rules & Regulation / Codes & Standards | TPA |
|---|---|-------|
| Turret fabrication | Appropriate code, standards, rules and regulations Turret fabricator yard to engage the DNV surveyor for review and approval of goods In accordance with the classification society regulations | Class |
| Turret Actuated Valve And Control Panel | API 6D / ISO 14313 Pipeline Valves ISO 17292 (was BS5351) Metal Ball Valves API 6FA API Specification for Fire Test for Valves – Production API 607 API Specification for Fire Test for Valves - Refining API RP14E Recommended Practice for Design and Installation of Offshore Production Platform Piping Systems API Std 598 Valve Inspection and Testing ASME B16.5 Pipe Flanges and Flanged Fittings – NPS ½ through NPS 25 ASME B16.34 Valves - Flanged, Threaded and Welding End ASME B31.3 Process Piping BS EN ISO 15761:2002 Steel wedge gate, globe and check valves BS EN ISO 10497:2002 Fire Testing of Valves ASME V Non-destructive examination ASME VIII Rules for Construction of Pressure Vessels - General Rules ASME IX Qualification standard for welding and brazing procedures, welders, brazers, and welding and brazing operators MSS SP-25 Standard Marking System for Valves, Fittings, Flanges and Unions. MSS SP-55 Visual inspection methods EN 10204 Metallic Products – Type of Inspection Documents. | Class |

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| | IEC 61508 Functional Safety of Electrical/Electronic/Programmable Electric Safety Related systems | |
| | IEC 60529 Degrees of Protection provided by enclosures | |
| Turret Electrical Cable Specification | IEC 60092-350 Shipboard Power Cables - General Construction and Test Requirements | Class |
| | IEC 60092-351 Insulating Materials for Shipboard Cables | |
| | IEC 60092-353 Single and Multi-Core, Non-Radial Field Power Cables with Extruded Solid Insulation for Rated Voltage 1kV and 3kV. | |
| | IEC 60092-354 Single and 3-Core, Non-Radial Field Power Cables with Extruded Solid Insulation for Rated Voltage 6kV up to 30kV. | |
| | IEC 60092-359 Sheathing Materials for Shipboard Power and Telecommunication Cables. | |
| | IEC 60093-3 Cables for Installation in Ships. | |
| | IEC 60228 Conductors of Insulated Cables. | |
| | IEC 60331 Fire-Resisting Characteristics of Electric Cables | |
| | IEC 60332-3 Cat. A Test on Electrical Cables Under Fire Conditions. Part 3: Test on Bunched Wire or Cables | |
| | IEC 60445(replaces 60446) Basic and safety principles for man-machining interface, marking and identification of conductors by colour. | |
| | IEC 60502 Extruded Solid Dielectric Insulated Power Cables for Rated Voltage from 1 kV to 30 kV. | |
| | IEC 60754-1 Test on Gases Evolved during Combustion of Materials for Cables. Part 1: Test Apparatus. Part 2: Test Procedures and Requirements. | |
| | EC 61034-1,2 Measurement of Smoke Density of Electric Cables Burning Under Defined Conditions. Part 1: Test Apparatus. Part 2: Test Procedures and Requirements | |
| Turret Instrumentation and Control Cable | IEC 11801 and IEC-61156-5 Ed. 2 Horizontal Data cable Cat 7 Cable | Class |
| | IEC 60092-350 Shipboard Power Cables - General Construction and Test Requirements | |
| | IEC 60092-351 Insulating Materials for Shipboard Cables | |
| | IEC 60092-353 Single and Multi-Core, Non-Radial Field Power Cables with Extruded Solid Insulation for Rated Voltage 1kV and 3kV. | |
| | IEC 60092-359 Sheathing Materials for Shipboard Power and Telecommunication Cables. | |
| | IEC 60093-3 Cables for Installation in Ships. | |
| | IEC 60228 Conductors of Insulated Cables. | |
| | IEC 60331 Fire-Resisting Characteristics of Electric Cables | |
| | IEC 60332-3 Cat. A Test on Electrical Cables Under Fire Conditions. Part 3: Test on Bunched Wire or Cables | |
| | IEC 60445 (replaces 60446) Basic and safety principles for man-machining interface, marking and identification of conductors by colour. | |
| | IEC 60793-1,2 Optical fibres -: Measurement methods and test procedures - General and guidance | |
| | IEC 60794-1,2,3 Optical fibre cables - Part 1-2: Generic specification - Basic optical cable test procedures | |
| | IEC 60754-1 Test on Gases Evolved during Combustion of Materials for Cables. Part 1: Test Apparatus. Part 2: Test Procedures and Requirements. | |
| | IEC 61034-1,2 Measurement of Smoke Density of Electric Cables Burning Under Defined Conditions. Part 1: Test Apparatus. Part 2: Test Procedures and Requirements | |
| | Measurement of Smoke Density of Electric Cables Burning Under Defined Conditions. Part 1: Test Apparatus. Part 2: Test Procedures and Requirements | |
| | IEC 61156-5 Symmetrical pair/quad cables with transmissions characteristics up to 600MHZ | |
| | IEEE 802.3z Gigabit Ethernet | |
| ANSI/TIA/EIA 598-A Optical Fiber Cable Colouring | | |
| Swivel Support Structure | DNV | Class |
| | Rules for Classification of Ships-January 2012 | |
| | DNV OS C101 Design of Offshore Steel Structures, General (LRFD Method-2011) | |
| | DNV OS C102 Structural Design of Offshore Ships - 2011 | |
| | DNV OS B101 Metallic Materials - 2009 | |
| | DNV OS C201 Structure Design of Offshore Units (WSD) – 2011 DNV RP | |
| | DNV RP C201 Buckling Strength of Plated Structures - 2002 | |
| | DNV RP C202 Buckling Strength of Shells - 2002 | |

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| | DNV RP C203 Fatigue Design of Offshore Steel Structures | |
| | DNV RP C204 Design Against Accidental Loads | |
| | DNV RP C205 Environmental Conditions and Environmental Loads | |
| | Classification Note 30.7 Fatigue Assessment of Ship Structures | |
| | Classification Notes 30.4 Foundations | |
| | DNV-OSS-102 Rules For Classification of Floating Production, Storage and Loading Units - October 2010 | |
| | OTHERS International Codes And Standards | |
| | API-RP 2A WSD Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms-Working Stress Design - 2000 | |
| | AISC 360-10 Specification for Structural Steel Buildings - 2010 | |
| | AWS D1.1 Structural Welding Code | |
| | ABS Guide Fatigue Assessment of Offshore Structures – 2003 | |
| Chain Stopper | DNV Rules for Classification of Ships-January 2012 | Class |
| | DNV OS C101 Design of Offshore Steel Structures, General (LRFD Method-2011) | |
| | DNV OS C102 Structural Design of Offshore Ships - 2011 | |
| | DNV OS E301 Position Mooring - 2010 | |
| | DNV OS A101 Safety Principles and Arrangements | |
| | DNV OS B101 Metallic Materials - 2009 | |
| | DNV OS C201 Structure Design of Offshore Units (WSD) - 2011 DNV RP | |
| | DNV RP C201 Buckling Strength of Plated Structures - 2002 | |
| | DNV RP C202 Buckling Strength of Shells - 2002 | |
| | DNV RP C203 Fatigue Design of Offshore Steel Structures | |
| | DNV RP C204 Design Against Accidental Loads | |
| | DNV RP C205 Environmental Conditions and Environmental Loads | |
| | Classification Note 30.7 Fatigue Assessment of Ship Structures | |
| | Classification Notes 30.4 Foundations | |
| | DNV-OSS-102 Rules For Classification of Floating Production, Storage and Loading Units - October 2010 | |
| | OTHERS | |
| | API-RP 2A WSD Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms-Working Stress Design-2000 | |
| | AISC 360-10 Specification for Structural Steel Buildings – 2010 | |
| | BS 5950-1:2000 Structural Use of Steelwork in Buildings Part 1 | |
| | ASME B16.9 – Factory Made Wrought Steel Butt Welding Fittings | |
| | ASME V – Non Destructive Examination | |
| | ASME VIII – Boiler and Pressure Vessel Code Division 1 and 2 | |
| | ASME IX – Welding and Brazing Qualifications | |
| | ANSI/AWS D1.1 – Structural Welding Code – Steel | |
| | API 14 E – Recommended Practice for Design and Installation of Offshore Production Platform Piping System | |
| | BS EN 10204 – Metallic Products – Type of Inspection Documents | |
| | ISO 898 – Mechanical Properties of Fasteners | |
| ISO 76 – Rolling Bearings – Static Load Ratings | | |
| ISO 281 – Rolling Bearings – Dynamic Load Ratings and Rating Life | | |
| Lower Pads Bearing | DNV-OS-E301-Offshore Standard: Position Mooring Oct 2010 | Class |
| | DNV-OSS-102-Offshore Service Specification: Rules for Classification of Floating Production Storage and Loading Units April 2012 | |
| | International Codes And Standards | |
| | API RP 2SK Design and Analysis of Station-keeping Systems for Floating Structures | |
| | ASME V Non Destructive Examination | |
| | ASME IX BPVC Welding and Brazing Qualifications | |
| | ASME/AFBMA Std 11-1978 Load Ratings and Fatigue Lift for Roller Bearings | |
| | ASME 77-DE39 Design Criteria to prevent core crushing failure in large Diameter, Case hardened, Ball and Roller Bearing | |
| ASME B16.46 Surface Texture (surface roughness, waviness and lay) | | |

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| | ASTM A148 Standard Specification for Steel Castings, High Strength for Structural Purposes | |
| | ASTM E165 Standard Test Method for Liquid Penetrant Examination | |
| | ASTM E709 Standard Guide for Magnetic Particle Examination | |
| | AWS D 1.1 Structural Welding Code | |
| | BS 3692 ISO metric precision hexagon bolts, screws and nuts | |
| | EN 10204 Metallic products – Types of Inspection Documents | |
| | ISO 76 Roller Bearing – Static Load Rating | |
| | ISO 281 Roller Bearing – Dynamic Load Ratings and Rating Life | |
| | ISO 898 Mechanical Properties of Fasteners | |
| | ISO 2768 General Tolerances | |
| | SIS/05/5900 Pictorial Surface Preparation Standard for Painting Steel Surfaces | |
| | VDI 2230 Systematic Calculation of High Duty Bolted Joints – VDI 1986 | |
| Mooring Installation Wheel | API RP 2SK – Design and Analysis of Station Keeping Systems for Floating Structures | Class |
| | API RP 9B – Recommended Practice on Application, Care and Use of Wire Rope in Offshore Service | |
| | DNV-OS-E301 – Position Mooring | |
| | ASME V – Non Destructive Examination | |
| | AWS D1.1 – Structural Welding Code - Steel | |
| | BS EN 10204 – Metallic Products – Type of Inspection Documents | |
| | ISO 10816 – Mechanical Vibrations | |
| | ISO 898 – Mechanical Properties for Fastening | |
| Turret Piping | VDI 2230 – Systematic Calculation of High Duty Bolted Joints | Class |
| | DNV Rules for Classification of Ships-January | |
| | DNV OS C101 Design of Offshore Steel Structures, General | |
| | DNV OS C102 Structural Design of Offshore Ships | |
| | DNV OS B101 Metallic Materials | |
| | DNV OS C201 Structure Design of Offshore Units (WSD) - 2011DNV RP | |
| | DNV RP C201 Buckling Strength of Plated Structures | |
| | DNV RP C202 Buckling Strength of Shells | |
| | DNV RP C203 Fatigue Design of Offshore Steel Structures | |
| | DNV RP C204 Design Against Accidental Loads | |
| | DNV RP C205 Environmental Conditions and Environmental Loads | |
| | DNV RP D101 Structural analysis of Piping Systems | |
| | Classification Note 30.7 Fatigue Assessment of Ship Structures | |
| | Classification Notes 30.4 Foundations | |
| | DNV-OSS-102 Rules For Classification of Floating Production, Storage and Loading Units | |
| | ASME | |
| | B31.3 Process Piping | |
| | B31.8 Gas Transmission and Distribution Piping System | |
| | B16.5 Pipe Flanges and Flanged Fittings | |
| | B16.9 Factory Made Wrought Butt Weld Fittings | |
| | Welding and Research Council (WRC) | |
| | WRC-107 Local stresses in spherical and cylindrical shells due to external Loading | |
| | WRC-297 Local Stress in the Nozzle and in the Vessel | |
| | American Petroleum Institute (API) | |
| | STD 610 Centrifugal Pumps for Petroleum, Heavy Duty Chemical and Gas Industry Services | |
| | STD 617 Axial, Centrifugal and Expander Compressors for Petroleum, Chemical and Gas Industry Services | |
| | TD 674 Positive Displacement Pumps - Reciprocating | |
| | STD 675 Positive Displacement Pumps - Controlled Volume | |
| STD 618 Reciprocating Compressors for Petroleum, Chemical & Gas Industry | | |
| STD 661 Air-Cooled Heat Exchangers for General Refinery Services. | | |
| STD 662 Plate Heat Exchangers | | |
| RP 520 Sizing, Selection and Installation of Pressure Relieving Devices in Refineries | | |

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| | <p>RP 14E Recommended Practices for Design and Installation of Offshore Production Platform Piping System.</p> <p>STD 6AF Bulletin on Capabilities of API Flanges under Combinations of Loads.</p> <p>American Society of Mechanical Engineers (ASME)</p> <p>Section III and VIII Boiler and Pressure Vessel Code</p> <p>OTHERS International Codes And Standards</p> <p>API-RP 2A WSD Recommended Practice for Planning, Designing and Constructing ,Fixed Offshore Platforms-Working Stress Design-2000</p> <p>AWS D1.1 Structural Welding Code</p> | |
| Chain Table and Inner Shafts | <p>DNV - Rules for Classification of Ships - January 2013</p> <p>DNV OS C101 - Design of Offshore Steel Structures, General (LRFD Method-Oct 2012)</p> <p>DNV OS C102 - Structural Design of Offshore Ships – October 2010</p> <p>DNV RP C201 - Buckling Strength of Plated Structures – January 2013</p> <p>DNV RP C202 - Buckling Strength of Shells – 2002</p> <p>DNV RP C203 - Fatigue Design of Offshore Steel Structures</p> <p>DNV RP C205 - Environmental Conditions and Environmental Loads</p> <p>Classification Note 30.7 - Fatigue Assessment of Ship Structures</p> | Class |
| Mooring Line | <p>DNV-OS-E301 – Offshore Standard: Position Mooring (Oct. 2010).</p> <p>DNV-OSS-102 – Offshore Service Specification: Rules for Classification of Floating Production, Storage and Loading Units (Oct. 2008).</p> <p>DNV-RP-C205 – Recommended Practice: Environmental Conditions and Environmental Loads (April 2007).</p> <p>API RP 2SK – Design and Analysis of Stationkeeping Systems for Floating Structures (2005).</p> <p>API RP 2A-WSD-Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms-Working Stress Design.</p> <p>Floating Structures: a guide for design and analysis, CMPT/OPL (1998).</p> <p>Heuristic Approach to Wave Drift Damping, Applied Ocean Research 15 (1993), P.J. Clark, S. Malenica & B. Molin.</p> <p>Hydrodynamics in Offshore and Naval Applications – Part 1, 6th International Conference on Hydrodynamics 2004, Xiao-Bo Chen, BV.</p> <p>Quasi-Dynamic Analysis of Mooring Systems using Ariane Software, BV Guidance Note, NI-461-DTO-R00-E.</p> <p>Prediction of Wind and Current Loads on VLCCs, OCIMF.</p> <p>A New Definition of the Rainflow Cycle Counting Method, I Rychlik, Int. Journal Fatigue (1987).</p> <p>Statistics of Extreme and Fatigue Loads in Deep Water Moorings – OMAE 2000.</p> <p>Classification of Mooring Systems for Permanent Offshore Units, BV Guidance Note, NI-493-DTM-R01-E.</p> <p>Recommendations for Equipment Employed in the Mooring of Ships at Single Point Moorings, OCIMF.</p> | Class |
| Mooring Installation Winch and HPU | <p>API RP 2SK – Design and Analysis of Station Keeping Systems for Floating Structures</p> <p>API RP 9B – Recommended Practice of Application, Care and Use of Wire Rope for Oilfield Service</p> <p>ASME V – Non Destructive Examination</p> <p>BS EN 10204 – Metallic Products – Type of Inspection Documents</p> <p>BS EN 60079-10-1 – Explosive atmosphere – Classification of areas – Explosive gas atmospheres</p> <p>BS EN 60529 – Specification for degree of protection provided by enclosures</p> <p>DNV-OS-E301 – Position Mooring</p> <p>FERA VDI 2230 – Systematic Calculation of High Duty Bolted Joints</p> <p>ISO 3730:1988 – Shipbuilding – Mooring Winch</p> <p>ISO 9089 – Marine Structures – Mobile Offshore Unit – Anchor Winch</p> <p>ISO 2768 – General Tolerances</p> | Class |
| Mooring System | <p>STANDARDS AND CODES</p> <p>API RP 2SK Recommended Practice for Design and Analysis of Stationkeeping Systems for Floating Structures, 3rd Edition (Oct. 2005).</p> | Class |

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| | | <p>DNV-OS-E301 – Offshore Standard: Position Mooring (Oct. 2010).</p> <p>DNV-OSS-102 – Offshore Service Specification: Rules for Classification of Floating Production, Storage and Loading Units (Oct. 2010).</p> <p>DNV-RP-C205 – Recommended Practice: Environmental Conditions and Environmental Loads (April 2007).</p> <p>TECHNICAL GUIDANCE</p> <p>Floating Structures: a guide for design and analysis, CMPT/OPL (1998).</p> <p>Heuristic Approach to Wave Drift Damping, Applied Ocean Research 15 (1993), P. J. Clark, S. Malenica & B. Molin.</p> <p>Hydrodynamics in Offshore and Naval Applications – Part 1, 6th International Conference on Hydrodynamics 2004, Xiao-Bo Chen, BV.</p> <p>Quasi-Dynamic Analysis of Mooring Systems using Ariane Software, BV Guidance Note, NI-461-DTO-R00-E.</p> <p>Prediction of Wind and Current Loads on VLCCs, OCIMF.</p> <p>A New Definition of the Rainflow Cycle Counting Method, I Rychlik, Int. Journal Fatigue (1987).</p> <p>Statistics of Extreme and Fatigue Loads in Deep Water Moorings – OMAE 2000.</p> <p>Classification of Mooring Systems for Permanent Offshore Units, BV Guidance Note, NI-493-DTM-R01-E.</p> <p>Recommendations for Equipment Employed in the Mooring of Ships at Single Point Moorings, OCIMF.</p> <p>Mean Wave Drift Spectral Force / Damping Program – User Manual.</p> | |
| Mooring Chain | | <p>API RP 2SK Recommended Practice for Design and Analysis of Station keeping Systems for Floating Structures, 3rd Edition (Oct. 2005).</p> <p>API SPEC 2F Specification for Mooring Chain.</p> <p>DNV OSS-102 Rules for Classification of Floating Production, Storage and Loading Units.</p> <p>DNV OS-E301 Position Mooring.</p> <p>DNV OS-E302 Offshore Mooring Chain.</p> | Class |
| Service Hoist | Gantry | <p>ASME V – Non Destructive Examination</p> <p>AWS D1.1 – Structural Welding Code - Steel</p> <p>BS EN 10204 – Metallic Products – Type of Inspection Documents</p> <p>BS EN 60079-10-1 – Explosive atmosphere – Classification of areas – Explosive gas atmospheres</p> <p>BS EN 60529 – Specification for degree of protection provided by enclosures</p> <p>ISO 10816 – Mechanical Vibrations</p> <p>HSE Standards</p> <p>OHSAS 18001 – Occupational Health & Safety Assessment System</p> <p>ISO 14001 : 2004 – Environmental Management System</p> <p>ISO 9001 : 2008 – Quality Management System</p> <p>ISM Codes – International Safety Management Code for the Safe Operation of Ships and for Pollution Prevention – (IMO) – if relevant</p> <p>International Ship & Port Facility Security (ISPS) Code – if relevant</p> <p>MARPOL 73/78 – International Convention for the Prevention of Pollutions from Ships – (IMO) – if relevant</p> <p>SOLAS – International Convention for the Safety of Life at Sea – (IMO) – if relevant</p> <p>STCW 95 – International Convention on Standards of Training, Certification and Watch keeping for Seafarers – (IMO) – if relevant</p> | Class/V A |
| Swivel Stack | | <p>Classification Society DNV (Det Norske Veritas)</p> <p>DNV-OS-E301-Offshore Standard: Position Mooring Oct 2010</p> <p>DNV-OSS-102-Offshore Service Specification: Rules for Classification of Floating Production Storage and Loading units Oct 2008</p> <p>OTHERS International Codes and Standards</p> <p>ANSI/AWS D1.1 Structural Welding Code – Steel</p> <p>ASME B16.20 Ring Joint Gaskets and Grooves</p> <p>ASME B16.9 Factory Made Wrought Steel Butt Welding Fittings</p> <p>ASME 77-DE-39 Design Criteria to Prevent Core Crushing Failure In Large Diameter, Case Hardened, Ball and Roller Bearing</p> <p>ASME V Non Destructive Examination</p> | Class |

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| | ASME VIII Boiler and Pressure Vessel Code Division 1 and 2 | |
| | ASME IX Welding and Brazing Qualifications | |
| | ASME B31.3 Process piping | |
| | ATEX 94/9/EC Equipment intended for use in potentially explosive atmosphere | |
| | API 14 E Recommended Practice for Design and Installation of Offshore Production Platform Piping System. | |
| | ASTM A790 Standard Specification for Seamless and Welded Ferritic/Austenitic Stainless Steel Pipe | |
| | BS EN 10204 Metallic Products Type of Inspection Documents | |
| | DNV-OS-D201 Electrical Installation | |
| | IEC 60079 Electrical apparatus for explosive Atmospheres | |
| | IEC 60092 Electrical Installations in Ship | |
| | IEC 60502 Power Cables with Extruded Insulation and their Accessories for Rated Voltages from 1 KV to 30KV – All Parts | |
| | IEC 60529 Classification of Degree of Protection Provided by Enclosures. | |
| | IEC 60533 Electrical and Electronic Installation in ships – Electro-Magnetic Compatibility | |
| | IEC 61000 Electromagnetic Compatibility (EMC) | |
| | IEC 61892 Mobile and Fixed Offshore Units – Electrical Installations | |
| | IP 15 Area Classification codes for installations handling flammable fluids | |
| | ISO 898 Mechanical Properties of Fasteners | |
| | ISO 76 Rolling bearings – Static load ratings | |
| | ISO 281 Rolling bearings – Dynamic load ratings and rating life | |
| | NACE MR 0175 Materials for use in H ₂ S containing environment in oils and gas production | |
| | NORSOK E-001 Electrical System | |
| | NORSOK I-001 Field Instrumentation | |
| | NORSOK I-002 Safety and Automation System | |
| Slewing Bearing | DNV-OS-E301-Offshore Standard: Position Mooring Oct 2010 | Class |
| | DNV-OSS-102-Offshore Service Specification: Rules for Classification of Floating Production Storage and Loading units April 2012 | |
| | OTHERS International Codes and Standards | |
| | API RP 2SK Design and Analysis of Station-keeping Systems for Floating Structures | |
| | ASME V Non Destructive Examination | |
| | ASME/AFBMA Std 11-1978 Load Ratings and Fatigue Lift for Roller Bearings | |
| | ASME 77-DE39 Design Criteria to prevent core crushing failure in large Diameter, Case hardened, Ball and Roller Bearing | |
| | EN 10204 Metallic products – Types of Inspection Documents | |
| | ISO 76 Roller Bearing – Static Load Rating | |
| | ISO 281 Roller Bearing – Dynamic Load Ratings and Rating Life | |
| | ISO 898 Mechanical Properties of Fasteners | |
| | ISO 2768 General Tolerances | |
| VDI 2230 Systematic Calculation of High Duty Bolted Joints – VDI 1986 | | |
| Foundation Pile | API RP 2SK – Design and Analysis of Station Keeping Systems for Floating Structures | CA |
| | ASME V – Non Destructive Examination | |
| | AWS D1.1 – Structural Welding Code | |
| | BS EN 10204 – Metallic Products – Type of Inspection Documents | |
| | DNV-OS-E301 – Position Mooring | |
| | ISO 898 – Mechanical Properties of Fasteners | |
| | ISO 2768 – General Tolerances | |
| ISO/IEC Guide 41:2003 – Packaging - Recommendations for addressing consumer needs | | |
| Pig Receiver | ASME V – Non Destructive Examination | Class |
| | ASME VIII – Boiler and Pressure Vessel Code Division 1 and 2 | |
| | ASTM A 370-07a – Standard Test Methods and definitions for Mechanical Testing of steel products | |
| | BS EN 10204 – Metallic Products – Type of Inspection Documents | |
| | DNV-OSS-102 – Offshore Service Specification: Rules for Classification of Floating Production, Storage and Loading Units (Oct. 2008) | |

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| | NACE MR0175 / ISO15156 – Material for use in H2S containing environments in oil & gas productions. | |
| Riser Installation Winch and HPU | API RP 2SK – Design and Analysis of Station Keeping Systems for Floating Structures | Class |
| | API RP 9B – Recommended Practice of Application, Care and Use of Wire Rope for Oilfield Service | |
| | ASME V – Non Destructive Examination | |
| | BS EN 10204 – Metallic Products – Type of Inspection Documents | |
| | BS EN 60079-10-1 – Explosive atmosphere – Classification of areas – Explosive gas atmospheres | |
| | BS EN 60529 – Specification for degree of protection provided by enclosures | |
| | DNV-OS-E301 – Position Mooring | |
| | FERA VDI 2230 – Systematic Calculation of High Duty Bolted Joints | |
| | ISO 3730:1988 – Shipbuilding – Mooring Winch | |
| | ISO 9089 – Marine Structures – Mobile Offshore Unit – Anchor Winch | |
| | ISO 2768 – General Tolerances | |
| Bend Latching Mechanism Stiffener | API RP 2SK- Design and Analysis of Station Keeping Systems for Floating Structures | CA |
| | ASME V – Non Destructive Examination | |
| | BS EN 10304 – Metallic Products – Types of Inspection Documents | |
| | BS EN 60079-10-1 – Explosive atmosphere – Classification of areas – Explosive gas atmospheres | |
| | BS EN 60529 – Specification for degree of protection provided by enclosures | |
| | FERA VDI 2230 – Systematic Calculation of High Duty Bolted Joints – VDI 1986 | |
| | ISO 898 – Mechanical Properties for Fasteners | |
| | ISO 2768 – General Tolerances | |
| | AWS D1.1 –Structural Welding Code - Steel | |
| | ISO/IEC Guide 41:2003 - Packaging - Recommendations for addressing consumer needs | |
| | BS 1133-19 - Packaging code. Use of desiccants in packaging | |
| | ISO 10204 - Steel and steel products -- Inspection documents | |

APPENDIX-C: RULES, REGULATIONS, CODE AND STANDARDS FOR SUBSEA SYSTEM

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| SUBSEA Systems/ Areas | Rules & Regulation / Codes & Standards | TPA |
| I & J Tube Protection Frame | API RP 2A - WSD Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms – Working Stress Design | CA |
| | AISC 360-10 Specification for Structural Steel Building | |
| | DNV-RP-H102 Marine Operations During Removal of Offshore Installations | |
| | Design of Welded Structures, Omer W. Blodgett | |
| Flexible Lines | API 17J 3rd Edition - Specification for Unbonded Flexible Pipe | CA |
| | API RP 17B 4th Edition - Recommended Practice for Flexible Pipe | |
| | DNV RP B401/2010 -Cathodic Protection Design | |
| | ASME B16.5/2009 - Pipe Flanges and Flanged Fittings | |
| Subsea Power & Optical Cable | DNV-OS-E301-Offshore Standard: Position Mooring Oct 2010 | CA |
| | DNV-OSS-102-Offshore Service Specification: Rules for Classification of Floating Production Storage and Loading units April 2012 | |
| | ISO 13628-5 - Petroleum and natural gas industries - Design and operation of subsea production systems - Part 5: Subsea Umbilicals. | |
| | API 17E - Specification for Subsea Production Control Umbilical | |
| | ISO 307 - Plastics – Polyimides – Determination of Viscosity Numbers | |
| | ISO 1402 - Rubber and Plastics Hoses and Hose Assemblies – Hydrostatic Testing | |
| | ISO 9000/9001 - Requirements for Quality Systems | |
| | ISO10005 - Quality Management – Guidelines for Quality Plans | |
| | ISO 14001 – Environmental Management | |
| | ISO 13268-1 - Petroleum and Natural Gas Industries – Design and Operation of Subsea Production System – Part 1: General Requirements and Recommendations | |
| API RP 2A - Recommended Practice for Planning Designing and Construction of Fixed Offshore Platforms | | |

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| | API RP 17I - Umbilical Installation Guidelines | |
| | BS 1021 - Cathodic Protection | |
| | BS 8010 Part 3 - Subsea Pipelines Design, Construction and Installation | |
| | BS EN 10244-2 - Specification for Testing Coating on Steel Wire | |
| | BS EN 10257-2 - Zinc or Zinc Alloy Coated Non-Alloy Steel Wire for Armouring either Power Cables or Telecommunication Cables | |
| | BS 1441 - Galvanised Steel Wire for Armouring Submarine Cables | |
| | BS 4832 - Specification for Compatibility between Elastomeric Materials and Hydraulic Fluid | |
| | BS 5099 - Spark Testing of Electrical Cables | |
| | BS 5173 - Methods of Testing for Rubber and Plastic Hoses and Hose Assemblies | |
| | BS 5467 - Specification for Armoured Cables with Thermosetting Insulation for Electricity | |
| | BS 6234 - Polyethylene Insulation and Sheath of Electric Cables | |
| | BS 6899 - Insulation Material Tests | |
| | BS OSHAS 18001 – Occupational Health and Safety Management | |
| | SAE J343 - Test and Test Procedures for SAE 100R Series Hydraulic Hose and Hose Assemblies | |
| | SAE J516 - Hydraulic Hose Fittings | |
| | SAE J517 - Hydraulic Hose | |
| | SAE AS4059 - Aerospace Standard – Cleanliness Classification for Hydraulic Fluids | |
| | DNV OS F101 - Submarine Pipeline Systems | |
| | DNV RP B401 - Cathodic Protection Design | |
| | DNV RP F109 - On-bottom Stability Design of Submarine Pipelines | |
| | DNV RP O401 - Safety and Reliability of Subsea Systems | |
| | ASTM B-3 - Specification for Soft or Annealed Copper Wire | |
| | ASTM B-8 - Specification for Concentrically Stranded Copper Conductors, Hard, Medium-hard or Soft | |
| | ASTM D-1248 - Specification for Polyethylene Plastics Extrusion Materials for Wire and Cables | |
| | ASTM E709 - Guide for Magnetic Particle Examination | |
| | IEC 60228 - Conductors of insulated cables | |
| | IEC 60304 - Standard Colours for insulation for Low Frequency cables and wires | |
| | IEC 60502 - Power cables with extruded insulation and their accessories for rated voltages from 1kV up to 30 kV | |
| | IEC 60811 - Common Test Methods for Insulating and Sheathing Material of Electric Cables | |
| | IEC 60811 - Common Test Methods for Insulating and Sheathing Material of Electric Cables | |
| | IEC 60885 - Electrical Test Methods for Electrical Cables | |
| Subsea Valves | API 6DSS Specification for Subsea Pipeline Valves 2009 | CA |
| | API RP 17H Remotely Operated Vehicle (ROV) Interfaces On Subsea Production Systems, ISO Adoption from ISO 13628-8 2009 | |
| | API RP 578 Material Verification Program for New and Existing Alloy Piping Systems 2010 | |
| | ASME V BPVC - Non-Destructive Examination 2011 | |
| | ASME VIII Div. 1 & 2 BPVC - Rules for Construction of Pressure Vessels 2011 | |
| | ASME IX Qualification standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators 2011 | |
| | ASME B31.4 Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids 2012 | |
| | ASNT-TC-1A Personnel Qualification and Certification in NDT 2011 | |
| | ASTM A182 Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forges Fittings, and Valves and Parts for High Temperature Service 2012 | |
| | ASTM A193 Alloy Steel and Stainless Steel Bolting Materials for High Temperature Service 2012 | |
| | ASTM A194 Carbon and Alloy Steel Nuts for High Pressure and High Temperature Service 2012 | |
| | ASTM A350 Carbon & Low-Alloy Steel Forgings, Requiring Notch Testing for Piping Components 2012 | |
| | ASTM A352 Ferritic Steel Castings for Pressure Containing Parts for Low Temperature Service 2012 | |

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| | ASTM A370 Test Methods and Definitions for Mechanical Testing of Steel Products 2012 | |
| | ASTM A388 Standard Practice for Ultrasonic Examination of Heavy Steel Forgings 2011 | |
| | ASTM A694 Standard Specification for Forgings, Carbon and Alloy Steel, for Pipe Flanges, Fittings, Valves and Parts for High Pressure Transmission Service 2008 | |
| | ASTM A995 Castings, Austenitic-Ferritic (Duplex) Stainless Steel, for Pressure-Containing Parts 2012 | |
| | ASTM E94 Guide for Radiographic Testing 2010 | |
| | ASTM E165 Standard Practice for Liquid Penetrant Examination for General Industry 2012 | |
| | ASTM E186 Reference Radiographs for Heavy-Walled (51 to 114 mm) Steel Castings 2010 | |
| | ASTM E446 Standard Reference Radiographs for Steel Castings up to 51mm in Thickness. 2010 | |
| | ASTM G48 Standard Test Methods for Pitting and Crevice Corrosion Resistance of Stainless Steels and Related Alloys by Use of Ferric Chloride Solution 2011 | |
| | BS EN 12680-1 Founding - Ultrasonic Examination - Part 1: Steel Castings for General Purposes 2003 | |
| | BS EN 10204 Metallic Materials - Types of Inspection Documents 2004 | |
| | DNV-OS-F101 Submarine Pipeline Systems 2012 | |
| | ISO 5208 Industrial Valves- Pressure Testing of Metallic Valves 2009 | |
| | ISO 5211 Industrial Valves - Part-Turn Actuator Attachment 2001 | |
| | ISO 8501-1 Preparation of Steel Substrate Before Application of Paints and Related Products - Visual Assessment of Surface Cleanliness - Part 1: Rust Grades and Preparation Grades of Uncoated Steel Substrates and of Steel Substrates After Overall Removal of Previous Coatings 2007 | |
| | ISO 9001 Quality Management Systems - Requirements 2008 | |
| | ISO 10012 Measurement Management Systems - Requirements for Measurement Processes and Measuring Equipment 2003 | |
| | ISO 14001 Environmental Management System 2004 | |
| | ISO 15156 / NACE | |
| | MR0175 Materials for use in H2S-Containing Environments in Oil & Gas Production Parts 1, 2 and 3 2009 | |
| | OHSAS 18001 Occupational Health & Safety Assessment System 2007 | |
| | Classification Society of the riser shall be DNV | |
| | DNV OSS-102 Rules for Classification of Floating Production, Storage and Loading Units. | |
| | DNV-OS-F101 Submarine Pipeline Systems | |
| | DNV-OS-F201 Dynamic Risers | |
| | DNV-RP –F109 on Bottom Stability of submarine pipelines | |
| | DNV-RP –B401-Cathodic Protection Design Others code and Standards | |
| | PI RP 17A -Design and operation of subsea production system, general requirements and recommendations | |
| | API RP 17 B- Recommended practice of flexible pipe | |
| | API Spec 17 J -Specification for unbounded flexible pipe | |
| | API TR 17 TR2-Tthe ageing of PA-11 in flexible pipes | |
| | API RP 1110- Recommended practice of pressure testing of liquid petroleum pipelines | |
| | API RP 1111 -Recommended practice for design, construction, operation and maintenance of offshore hydrocarbon pipeline and risers | |
| | API St. 104- Standard for welding of pipelines and related facilities | |
| | API RP 2RD - Design of riser for floating production systems and TLPS | |
| | ASME B31.4 -Pipeline transportation systems for liquid hydrocarbons and other liquids | |
| | ASME B31.8- Codes for pressure piping: Gas transmission and distribution piping systems | |
| | ASME B16.5 -Pipe flange and fitting NPS1/2" through NPS 24 | |
| | ASME IX – BPVC welding and Brazing Qualifications | |
| | ISO 10474 (EN10204)-Steel and Steel products | |
| | ISO 13628 -Petroleum and natural Gas Industry: Design and operation of subsea production Systems | |
| | AWSD1.1 -Structural welding Code: Steel | |
| | NACE-MR0175 –Materials for use in H2S containg environment in oils and has production | |
| Subsea Installation Works | API RP 2A – WSD-Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms – Working Stress Design, 21st Edition, Errata and supplement 3, October 2007. | CA/MWS |
| | Recommended Practice for Flexible Pipe API 17B | |
| | Specification for Subsea Production Control – Umbilicals API 17E | |
| Riser | Classification Society of the riser shall be DNV DNV OSS-102 Rules for Classification of Floating Production, Storage and Loading Units. DNV-OS-F101 Submarine Pipeline Systems DNV-OS-F201 Dynamic Risers DNV-RP –F109 on Bottom Stability of submarine pipelines DNV-RP –B401-Cathodic Protection Design Others code and Standards PI RP 17A -Design and operation of subsea production system, general requirements and recommendations API RP 17 B- Recommended practice of flexible pipe API Spec 17 J -Specification for unbounded flexible pipe API TR 17 TR2-Tthe ageing of PA-11 in flexible pipes API RP 1110- Recommended practice of pressure testing of liquid petroleum pipelines API RP 1111 -Recommended practice for design, construction, operation and maintenance of offshore hydrocarbon pipeline and risers API St. 104- Standard for welding of pipelines and related facilities API RP 2RD - Design of riser for floating production systems and TLPS ASME B31.4 -Pipeline transportation systems for liquid hydrocarbons and other liquids ASME B31.8- Codes for pressure piping: Gas transmission and distribution piping systems ASME B16.5 -Pipe flange and fitting NPS1/2" through NPS 24 ASME IX – BPVC welding and Brazing Qualifications ISO 10474 (EN10204)-Steel and Steel products ISO 13628 -Petroleum and natural Gas Industry: Design and operation of subsea production Systems AWSD1.1 -Structural welding Code: Steel NACE-MR0175 –Materials for use in H2S containg environment in oils and has production | CA |

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| | Recommended Practice for Design and Analysis of Station Keeping Systems for Floating Structures – October 2005 API RP 2SK | |
| | Analysis of Spread Mooring Systems for Floating Drilling Units – 1987 API 2RP | |
| | Marine Operation, General – October 2011 DNV-OS-H101 | |
| | Marine Operations, Design and Fabrication - January 2012 DNV-OS-H102 | |
| | Load Transfer Operations DNV-OS-H203 | |
| | Rules for Submarine Pipeline Systems DNV OS-F-101 | |
| | Environmental Conditions and Environmental Loads - October 2010 DNV-RP-C205 | |
| | Modeling and Analysis of Marine Operations – February 2014 DNV-RP-H103 | |
| | Risk Management in Subsea and Marine Operations DNV RP H101 | |
| | Rules for Planning and Execution of Marine Operations – January 1996/2000.DNV | |
| | Rules for Classification of Ships, January 2014 (part 3 Chapter 1) DNV | |
| | Standard for Certification of Lifting Appliances, June 2013 DNV No. 2.22 | |
| | Portable Offshore Units – May 2011 DNV No. 2.7-3 | |
| | GL Noble Denton Guidelines For Load Outs, Dec 2010 0013/ND | |
| | GL Noble Denton Guidelines For Marine Transportations, June 13 0030/ND | |
| | American Welding Society Structural Welding Code AWS D1.1:2010 | |
| | Specification for Structural Steel Buildings – June 2010 ANSI / AISC 360-10 | |
| | Assessment of Loads | |
| | API RP 2A - WSD Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms. | |
| | DNV RP C205 Environmental Conditions and Environmental Loads. | |
| | DNV-RP-H103 Modelling and Analysis of Marine Operations. | |
| | Rules for Planning and Execution of Marine Operations. | |
| | Structural Steel Strength Design | |
| | API RP 2A - WSD Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms. | |
| | ANSI / AISC 360-10 Specification for Structural Steel Buildings. | |
| | Rules for Planning and Execution of Marine Operations. | |
| | Load out, Lifting and Transportation - Operations and Design | |
| | DNV-OS-H201 Load Transfer Operations. | |
| | DNV-RP-H103 Modelling and Analysis of Marine Operations. | |
| | Rules for Classification of Ships (part 3 Chapter 1). | |
| | GL Noble Denton Report No.0013/ND, Guidelines for Load out. | |
| | GL Noble Denton Guidelines For Marine Transportation 0030/ND | |
| | Rules for Planning and Execution of Marine Operations. | |
| | Welding | |
| | AWS D1.1 – Structural Welding Code – Steel. | |
| | Mooring and Towing | |
| | Rules for Planning and Execution of Marine Operations. | |
| | DNV-RP-H103 Modelling and Analysis of Marine Operations. | |
| | GL Noble Denton Guidelines For Marine Transportation 0030/ND | |
| | API 2RP Analysis of Spread Mooring Systems for Floating Drilling Ships. | |
| | API RP 2SK Recommended Practice for Design and Analysis of Station Keeping Systems for Floating Structures. | |
| PLEM & MID WATER ARCH (MWA) | API SPEC 17J, Specification for Unbonded Flexible Pipe, Third Edition, July 2008. | CA |
| | DNV OS-F101, Submarine Pipeline Systems, 2010. | |
| | AISC 335, Specification for Structural Steel Buildings, Allowable Stress Design and Plastic Design, American Institute of Steel Construction, 1989. | |
| | API RP 2A-WSD, Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms – Working Stress Design, American Petroleum Institute, 21st ed, Dec 2000. | |
| | API RP 2SK, Design and Analysis of Station keeping Systems for Floating Structures, American Petroleum Institute, 3rd ed. Oct 2005. | |
| | AWS D1.1, Structural Welding Code-Steel, American Welding Society, 22nd ed. Mar 2010. | |
| | AISC 335 Specification for Structural Steel Buildings, Allowable Stress Design and Plastic Design, American Institute of Steel Construction 1989 | |
| | API Standard 1104 Welding of Pipelines and Related Facilities 2008 | |
| | API Specification 2H Specification for Carbon Manganese Steel Plate for Offshore Structures 2006 | |
| API Specification 5L Specification for Linepipe, 44th edition 2007 | | |

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| API Specification 17J Specification for Unbonded Flexible Pipe (identical to ISO 13628-2:2006) 2009 |
| API 6DSS Specification for Subsea Pipeline Valves 2009 |
| API RP17B Recommended Practice for Flexible Pipe (identical to ISO 13628-11:2007) 2009 |
| API RP 2A-WSD Recommended Practice for Planning, Designing and Constructing Fixed Offshore platforms – Working Stress Design 2000 |
| ASME Section VIII Div. I Boiler and Pressure Vessel Code – Rules for construction of Pressure Vessels 2011 |
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APPENDIX-D: ABBREVIATION

1. **Conversion:** Change that substantially alters the dimensions, carrying capacity, engine power or the type of the ship.
2. **Builder:** Signifies the party contracted to build a vessel in compliance with the Society's rules.
3. **Certificate:** A document confirming compliance with the Society's rules or with other rules and regulations for which the Society has been authorized to act.
4. **Certification:** A service confirming compliance with applicable requirements on the date that the survey was completed.
5. **Class:** Class is assigned to and will be retained by vessels complying with applicable requirements of the Society's rules.
6. **Classification:** A service which comprises the development of independent technical standards for vessels - the rules and to verify compliance with the rules throughout the vessels' life.
7. **Convention vessel:** A vessel which due to its tonnage, usage or dimensions would, if trading in international waters or on international voyages, fall within the requirements of any, or any part, of the IMO Conventions.
8. **Designer:** Signifies a party who creates documentation submitted to the Society for approval or information.
9. **Flag administration:** The maritime administration of a vessel's country of registry.
10. **IACS:** The International Association of Classification Societies.
11. **IMO:** Signifies the International Maritime Organization.
12. **ISO:** Signifies the International Organisation for Standardization.
13. **SOLAS:** Safety of life at Sea
14. **Lay-up:** A terminology used for vessels that are out of commission. In this state the vessel may be at anchorage or permanently moored in a safe harbor
15. **Manufacturer:** Signifies the entity that manufactures the material or product, or carries out part production that determines the quality of the material or product, or does the final assembly of the product
16. **Owner:** Signifies the registered owner or manager of the vessel or any other organization or person who has assumed the responsibility for operation of the vessel and who on assuming such responsibility has agreed to take over all the duties and responsibilities
17. **Plan approval:** Signifies a systematic and independent examination of drawings, design documents or records in order to verify compliance with the rules or statutory requirements. Plan approval will be carried out at the discretion of the Society, which also decides the extent and method of examination
18. **Society:** It is an independent foundation with the objective of safeguarding life, property, and the environment. The foundation operates through the limited company, which is registered and operates through a worldwide network of offices.
19. **Statement of compliance:** A document confirming compliance with specified requirements. Such documents may be issued by the Society in cases where it has not been authorized to certify compliance
20. **Rules:** All requirements adopted by the appropriate approval body of the Society as the basis for classification.
21. **Survey:** Signifies a systematic and independent examination of a vessel, materials, components or systems in order to verify compliance with the rules and/or statutory requirements. Surveys will be carried out on the vessel, at the construction or repair site as well as at sub-suppliers and other locations at the discretion of the Society, which also decides the extent and method of control
22. **Verification:** A service that signifies a confirmation through the provision of objective evidence (analysis, observation, measurement, test, records or other evidence) that specified requirements has been met.
23. **ITP:** Independent Third Party
24. **Change Orders:** The request to the Owner made by builder or any of the affiliates of builder to compensate any additional cost incurred the builder due to change in scope of work
25. **FSO:** Floating Storage Offloading
26. **FPSO:** Floating Production Storage and offloading
27. **FLNG:** Floating Storage Liquefied Natural Gas
28. **FSRU:** Floating Storage Re-gasification Unit